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Design And Implement of Automatic Fire Detection and Monitoring In Forest Zone

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ABSTRACT
Separately as of cause sad defeat of life and precious usual and person property counting thousands of hectares of woods and hundreds of house, woods fire are a huge threat to not wastefully fit full-grown forest and defence of the surroundings. Every day, thousands of woods fire crossways the sphere reason disaster further than gauge and account. This subject has be the investigate attention for a lot of being; present are a enormous quantity of extremely healthy deliberate solution obtainable out present for difficult or still prepared for employ to make your mind up this difficulty. The wood is one of the mainly significant prosperity of each state. The forest fire destroy the flora and fauna habitat, compensation the surroundings, affect the climate, plunder the organic property of the earth, etc. So the woodland fire discovery is a chief subject in the three decade. At the similar occasion the woods fire contains to be detect as quick as likely.

Keywords: organic property, surroundings, woods fire, Engineering and Technology

I. INTRODUCTION

In the future means, a colour spatial segmentation, sequential segmentation, worldwide movement recompense, Support Vector Machine (SVM) classifications are second-hand to sense the flames and to section the fire as of the video series. The means is implementing in excess of the two genuine occasion information sets. The future means is most appropriate for segmenting fire proceedings over unimpeded videos in genuine time. Woods is single of the main riches of our state. Forest gives huge fabric merchandise and ecological military. They are useful for manufacturing as well as country fiscal enlargement. Forest provides wood, resins, rubber, food items, medicine etc. Forests also give best ecological overhaul to the planet. The trees in the forests create oxygen by photosynthesis, which reduce worldwide warm. Forest soaks up carbon dioxide which is a uncooked fabric for photosynthesis. Forests prevents soil erosion, absorb toxic gases. Forests are the house for undomesticated flora and fauna. At the equal point in time, at what time the forest is beneath fire it emit assortment of carbon dioxide leads to type of conditions alter and worldwide warm. consequently the forest flames has to be detect at previous phase. Unpaid to segregation, isolation, rough climate, scarcity of frontier staff, the near the start finding of woods flames is a hard task. In the work, the next methods are second-hand to get improved fire discovery accurateness and segmentation of fire as of real occasion video. The future work equipment the color spatial segmentation, chronological segmentation, worldwide movement recompense and chronological categorization method.

II. SYSTEM ANALYSIS

Existing systems uses electronic sensors to detect fire or smoke. The change in temperature indicates the presence of fire or smoke in a region which can be detected by the sensors using radiation heat. As forests are in a remote location, installation and maintenance of sensors over large area is difficult. So the sensors cannot be used to deploy over large area such as forests, petrochemical plant, and saw mills etc. The other consequence is, the sensor would detect heat or smoke only when it reaches nearer.

The presences of fire in video streams are indicated by semantic events. Most of the existing systems can only be used for the videos obtained from stationary cameras and videos obtained from the controlled lightening conditions. These existing automatic fire detection systems cannot be used for video streams obtained from mobile phones or any hand held devices. The KILLFIRE method is proposed to overcome these limitations. The KILLFIRE method works on three sections:

i) To improve the accuracy, the Fire-like pixel detector color model is used,
ii) To avoid the problem occurring in stationary videos, the new technique of motion compensation is used,
iii) To identify and segment the fire in video streams, the segmentation method is used. The KILLFIRE is implemented over the two video set with different characteristics.

The components of KILLFIRE method are a color spatial segmentation is used to pre-select the region that is expected as fire pixels. The extraction of sparse flow in the fire region and extraction of dense flow in the background is done by temporal segmentation.

III.PROJECT DESCRIPTION

A. Color spatial segmentation

The color based modeling for detecting fire is a good approach, because it performs faster than any other traditional strategies. The color based segmentation reduces the content before performing any complex calculations. The proposed color model is used to detect fire on videos. The Fire-like Pixel Detector (FPD) perform the spatial segmentation as an preliminary step of the fire detection The proposed model analyze the region of interest (ROI's) from the fire images. For analyzing the ROI's the 3D cylindrical histogram is used to examine the relationship among three HSV components. The fire color pixel visualization is shown in Fig.1. The Fig.1 (a) shows ROI's in fire image, Fig.1 (b) shows the fire color pixel distribution which highlights the saturation and hue components. When the hue component is around 00 (red), then the saturation will have more intensity. If a hue is around 600(yellow), then the saturation will have lesser intensity and evenly distributed. Fig. 1(c) and 1(d) shows two complementary points of view of the HSV distribution. If the value point is high then the hue is close to yellow.

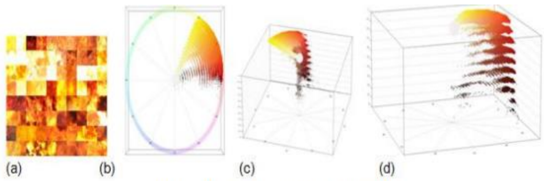


Figure 1: Fire color pixels visualization on HSV color space

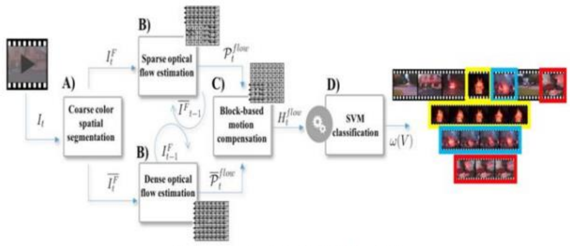


Figure 2 Overview of the KILLFIRE method

B. Temporal segmentation

The KILLFIRE method analyses the motion pattern of fire region after performing the color spatial segmentation using FPD. It and If is created, the two image matrices for sparse optical flow estimation and dense optical flow estimation. The following equations are used to compute these two matrices. The figure 2 gives the overview of KILLFIRE method which consists of 4 modules:

A) The spatial segmentation by means of the FPD model.

B) The temporal segmentation with the estimated flow in the candidate region and the background.

C) Estimation of the global flow and motion compensation.

D) SVM Classification for the motion pattern.

The disparity existing in equation confines the H component to the interval of yellow-red dominant colors. The equation, in turn, confines the minimum values for S and V as a function of component H. Given a fixed H in the precise range, the S and V components are limited by a circumference centered at (1,1). The radius varies according to component H. The radius of this circle has maximum value when H = 0 (pure red) and decreases quadratic ally.

C. Motion estimation

The motion estimation can be done after the computation of IT and ITF. The motion estimation is possible by using sparse motion estimation, and dense motion estimation. Sparse motion estimation: The processing time can be reduced by first detecting points of interest to track in the candidate region instead of processing all the pixels in a segment. The Harris Corner detector is used to extract the points of interest.

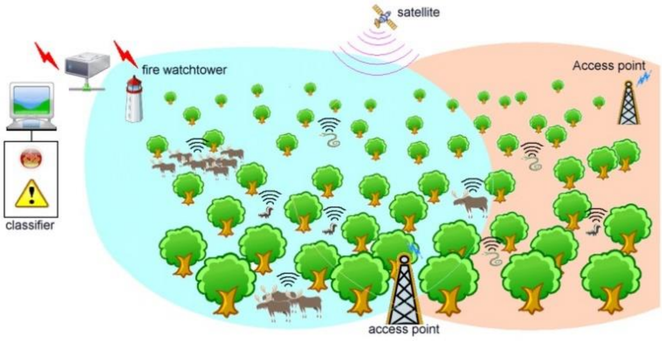
Dense motion estimation: The sparse optical flow selects the dynamic information that is more related with target of interest for the fixed camera. When there is a camera motion, the resulting movement suppresses the object motion information. The frame ITF represents the background of the scene can be used to extract the dense optical flow information. The tracking of dense information is used to extract the global motion from the entire scene. The dense motion estimation considers all the points in the flow field and the points are sampled at uniform intervals. The Gunnar Farneback's algorithm is used to generate the flow dense flow Pt. Block-based motion compensation: Sparse motion estimation and dense motion estimation are used to extract the patterns from stationary cameras. These estimations cannot be used for moving cameras as in the cell phone. Due to the movement of cameras, the extra motion component will be added to every frame. The block based motion compensation partition the frames into smaller blocks. The global flow estimation is calculated from these blocks. After calculation, the flow component is subtracted from the original frame. From the ITF, the dense motion is extracted and is used for block-based motion compensation to identify camera motion. The mean local flows are used to estimate the global flow. To calculate the local flow, the frame ITF, is divided into 32 x 32 pixels of non-overlapping blocks. The mean direction is calculated for each block bit and is also called as block dominant flow φit. To do this, the direction of the flow is to be calculated. So, the flow field is divided into four quadrant sets to calculate the direction of flow form up down and left-right directions. Then the direction flows are grouped into their quadrants. Let Qs = {φk :

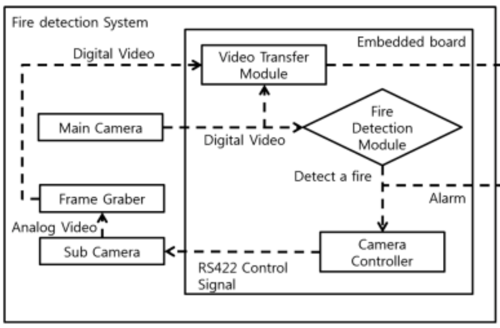
1 ≤ k ≤ ns}, where ns = |Qs|, be the set hold the orientation flows of the quadrant with the highest amount of flow. After the calculation of block dominant orientation φit of all the blocks, the block dominant flows are quantized into global histogram of the background flow HTG. The global histograms are sampled into eight bins of equal width.

D. Support Vector Machine classification

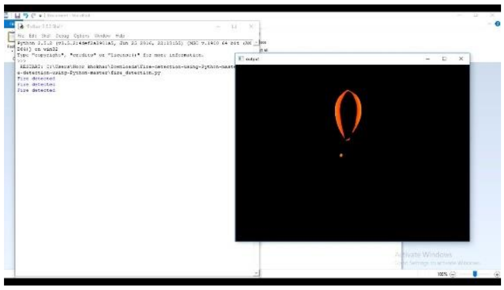
The SVM is used in almost all the applications particularly for event detection. From the calculated histograms, the heat flow of each frame is given as input for SVM classifier. The SVM classifies whether the given motion pattern is fire transition or not. The real time dataset is used to implement the SVM, for which 30% of the fire videos is taken for training phase and the remaining 70% of the videos is taken for testing phase.

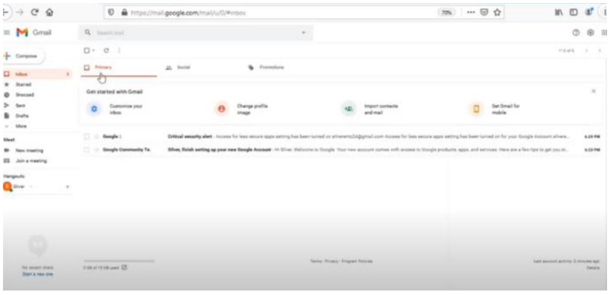
IV. SYSTEM DESIGN





V. RESULTS AND DISCUSSION





VI. CONCLUSION

Fire Detection System has been developed using Image Processing and Python software. This system has the ability to apply image processing techniques to detect fire. This system can be used to monitor fire and has achieved 90% accuracy for single webcam. The system works on real time, as it extracts frames in every 2 seconds, it provides continuous monitoring. This system has high efficiency as it has incorporated techniques of Area detection, Colour detection, Motion detection, and Smoke detection as well as Humidity and Temperature detection. For better performance outcomes use of RGB, HSV and YCbCr colour space is made in the detection techniques, as per their suitability, efficiency and properties. The different parameters like threshold value, blind spots will be handled properly in our future research. Thus application of proposed fire detection system gives us a better system performance in term of fewer false alarms and thus a higher system performance is achieved.

For further accuracy use of Neural Networks for decision making can be made and GSM module can also be implemented for sending SMS to nearby fire station in case of severe fire. Water sprinklers can also be incorporated. By research and analysis, the efficiency of the proposed Fire detection system can be increased. The margin of false alarms can be reduced even further by developing algorithms to eliminate the detection of red colour cloth as fire. By proper analysis, suitable location height and length for camera instalment can be decided, in order to remove blind-spot areas.

VII. REFERENCES

[1]. B. Ko and S. Kwak, "Survey of computer visionbased natural disaster warning systems," Optical Engineering, vol. 51, no. 7, Article ID 070901, 2012.

[2]. J. R. Martinez-de Dios, B. C. Arrue, A. Ollero, L. Merino, and F. Gómez-Rodríguez, "Computer vision techniques for forest fire perception," Image and Vision Computing, vol. 26, no. 4, pp. 550–562, 2008.

[3]. Y. Meng, Y. Deng, and P. Shi, "Mapping Forest Wildfire Risk of the World," in World Atlas of Natural Disaster Risk, P. Shi and R. Kasperson, Eds., pp. 261–275, Springer Berlin Heidelberg, Berlin, Germany, 2015.

[4]. P. M. Hanamaraddi, "A Literature Study on Image Processing for Forest Fire Detection," IJITR, vol. 4, pp. 2695–2700, 2016.

[5]. P. Podržaj and H. Hashimoto, "Intelligent space as a framework for fire detection and evacuation," Fire Technology, vol. 44, no. 1, pp. 65–76, 2008.

[6]. C. Thou-Ho, W. Ping-Hsueh, and C. Yung-Chuen, "An early fire-detection method based on image processing," in Proceedings of the 2004 International Conference on Image Processing, ICIP '04, vol. 3, pp. 1707–1710, 2004.

[7]. Y. Wang and J. Ye, "Research on the algorithm of prevention forest fire disaster in the Poyang Lake Ecological Economic Zone," Advanced Materials Research, pp. 5257–5260, 2012.

[8]. D. Alzughaibi, H. A. Hakami, and Z. Chaczko, "Review of human motion detection based on background subtraction techniques," International Journal of Computer Applications, vol. 122, 2015.

[9]. E. Premal and S. S. Vinsley, "Image processing based forest fire detection using YCbCr colour model," in Proceedings of the 2014 International Conference on Circuits, Power and Computing Technologies, ICCPCT 2014, pp. 1229–1237, 2014.

[10]. V. Vipin, "Image processing based forest fire detection," International Journal of Emerging Technology and Advanced Engineering, vol. 2, pp. 87–95, 2012.

[11]. L.-H. Chen and W.-C. Huang, "Fire detection using spatial-temporal analysis," in Proceedings of the World Congress on Engineering, pp. 3–5, 2013.

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